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ABSTRACT

A study examined whether the more inviting text structure of informational storybooks (compared to an information book) influences comprehension of scientific information. Ninety-six third-grade subjects were drawn from eight classrooms in four elementary schools in a mid-size metropolitan area in the southern United States. Within each class, six students were assigned to a study group and six to a control group. Each group was balanced for gender and ability as identified by the classroom teacher. Students were given pretests prior to having either an information book or an informational storybook concerning space or earth science read to them. Immediately after the reading, and again 6 weeks later, students completed a 10-item posttest. Results indicated that while the study and control groups performed equally well on the pretest of subject matter prior knowledge, students who were read the informational storybook made greater gains in scores on both the posttest and the 6-week test than students who were read the information book. Findings suggest that information embedded in a narrative format may be more memorable than information in a straight expository format. (Three tables and two figures of data are included. (Contains 22 references.) (RS)

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A Comparison of Third Grade Children's Listening Comprehension of Scientific Information Using an Information Book and an Informational Storybook

Rationale. Research has consistently documented that most people lack understanding of the scientific method and are not able to demonstrate even a conversational knowledge of significant scientific discoveries or theories (Edwords, 1986; Elliott, 1986; Gogolin & Swartz, 1992, Hornbeck, 1988). Students today are not learning science concepts and even more disturbing, consider reading about science as "antithetical to the development of scientific thinking" (Armbruster, 1992/1993). Therefore, the inevitable question facing classroom teachers today is how to engage and encourage student interest and comprehension of necessary scientific information and texts that results in student ownership of ideas, concepts, and applications.

Theoretical Framework. Scientific literacy is by its very nature dependent upon both the availability of sound scientific information along with student ability and motivation to read and assimilate this information. Many factors influence the nurturing of an interest and ability in science: 1) Attitudes toward both science and reading (Yager & Penick, 1984, 1986), 2) Prior knowledge and familiarity with the topic (Finley, 1991; Smith, 1978), 3) Text structure, vocabulary, and exposure to comprehension monitoring strategies (Armbruster, 1989; Guzzetti, 1992; Yochum, 1991).

The need then is to find what texts or tools have the power to both influence a student's attitudes and activate prior knowledge to evoke learning of scientific information. In addition to typical science trade books for children (Pappas, 1987), recent research indicates that informational storybooks, described as a "gray genre," "infotainment genre" (Leal, 1989, 1992, 1993) or a "fuzzy genre" (Pappas, Kiefer, & Levstik, 1990), offer some unexpected benefits in helping connect student imagination and motivation with scientific learning. This type of book blends imagination with information by embedding scientific information in a narrative presentation thus providing opportunities that link information, entertainment, and learning in the modern world (Lucas, 1991).

Objectives. It was the goal of the current study to examine comprehension increases in children's understanding about earth science and space science when read either an information book or an informational storybook to determine if the more inviting text structure of the informational storybook would indeed influence comprehension of scientific information. More specifically, using a pre-, post-, and 6 week follow up ten-question test, the study examined differences in comprehension between students read an information book and those who were read an informational storybook.

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Procedures. Ninety-six third grade subjects were drawn from eight classrooms in four elementary schools in a mid-size metropolitan area in the South. Within each class, six students were assigned to a study group and six to a control group. Each group was balanced for gender and ability, as identified by the classroom teacher. The researcher then followed the same format with each group for each book read: (1) introduced the study and procedures and orally administered a ten-question

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multiple choice pre-test on the topic of the text, (2) introduced the book title and author and then read aloud an informational storybook to the study groups and an information book to the control groups; (3) orally administered a different form of the same ten question multiple choice test; (4) six weeks later again gave the same ten-question test.

Four texts were selected for this study: two information books and two informational storybooks. The space information book read was entitled The Planets in our Solar System (Branley, 1981) and the space informational storybook read was The Magic School Bus Lost in the Solar System (Cole, 1990). The second topic for investigation focused on earth science, examining student understanding of the inside of the earth. Due to the length of the text, selected passages from the information book, The Earth's Crust (Adler, 1963), were read to the students. The earth informational storybook read was How to Dig a Hole to the Other Side of the World (McNulty, 1979).

Results. Initial analyses indicated that text type significantly influenced students' listening comprehension of scientific information. Means and standard deviations for the number of test questions correct on pre, post, and 6 week tests were computed and are displayed in Figure 1.

Because of the role of prior knowledge, it was deemed important to measure the differences between what students already knew, as demonstrated on the pre-test, with any increases in the number of questions answered correctly on the post-test and 6-week test. As expected, there were greater differences between pre-tests and post-test and 6-week test scores for students who were read the informational storybook. These mean differences and standard deviations are shown in Figure 2.

Overall results showed that both study and control groups did equally well on the pre-tests of subject matter prior knowledge ($p < .05$), but students who were read the informational storybook made greater gains in scores on both the post-test and 6 week test than did the students who were read the information book. In order to measure the significance of differences in test scores between text types, tests of significance (t tests) were calculated with a one-tailed critical region set at a 95% confidence level. Increases in test scores for those students who listened to the informational storybook were significantly greater at each testing except for the increase which occured between the pre- and 6 week test on earth science. These differences are displayed in Table 1.

Table 1: *t* Tests for Significant Increases in Retention of Scientific Information

	Pre-Post	Pre-6 Week
Both Topics Combined	$t = 3.08$*	$t = 2.66$*
Earth science	$t = 1.93$*	$t = 1.12$
Space science	$t = 2.58$*	$t = 2.55$*

* = $p < .05$

In order to explain the lack of significance between the pre- and 6 week scores for earth science, data was then examined by class groups for potential outliers. Class 3 was found to vary significantly from other classes. The mean test score increases across text types ranged from .42 to 1.67 except for class 3 which registered a mean of 3.25. When gain scores for Class 3 were examined by text type, the group that listened to the information book averaged a greater gain ($\bar{X} = 4.2$) than did the group who were read the informational storybook ($\bar{X} = 2.2$). Eliminating this outlying class from the text type contrast produced significant differences by text type for the earth science topic. Without the presence of Class 3, tests of significance (*t* tests) were again calculated. These reults are reported in Table 3.

Table 3: Follow-up *t* Tests for Significant Increases in Retention of Scientific Information

	Pre-Post	Pre-6 Week
Both Topics Combined	$t = 3.08$*	$t = 2.66$*
Earth science without Class 3	$t = 2.61$*	$t = 2.07$*
Space science	$t = 2.58$*	$t = 2.55$*

* = $p < .05$

Implications. These findings suggest that information embedded in a narrative format may be more memorable than information in a straight expository format. The greater retention of scientific information with the informational storybook may indicate that informational storybooks can be a useful tool to interest students in becoming scientific thinkers and readers. Such texts could serve as introductions to straight expository science texts, as motivators for discussions involving new scientific information as well as to tap children's prior knowledge of new scientific topics (Leal, 1993), as a means for teaching children to write informational storybooks by inviting them to use both narrative and expository text characteristics has the benefit of teaching children textual characteristics as well as new scientific information, for planning integrated thematic units.

If adults and students are more easily engaged with new information, and are even able to better learn and remember specific information with an informational storybook, then using these books in the classroom may be an important resource for today's classroom teachers. Indeed, if "imagination rules reason, and not the other way around," (Kilpatrick, 1993), and student attitudes can be influenced positively towards science learning at the same time as learning valuable information, then the informational storybook may be part of the answer to the question of how students will learn and eventually be able to demonstrate a conversational knowledge of significant scientific discoveries and theories.

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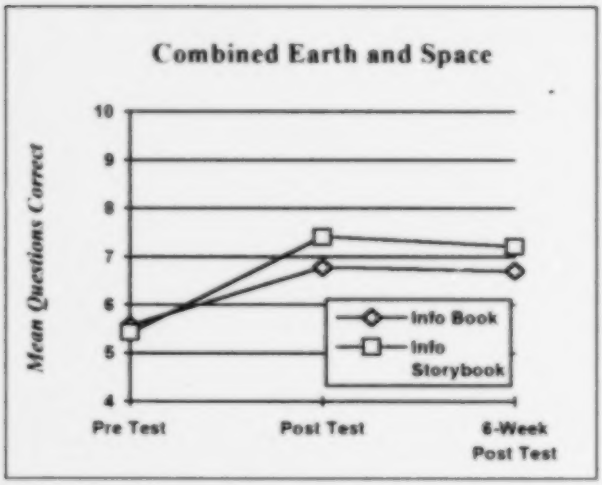
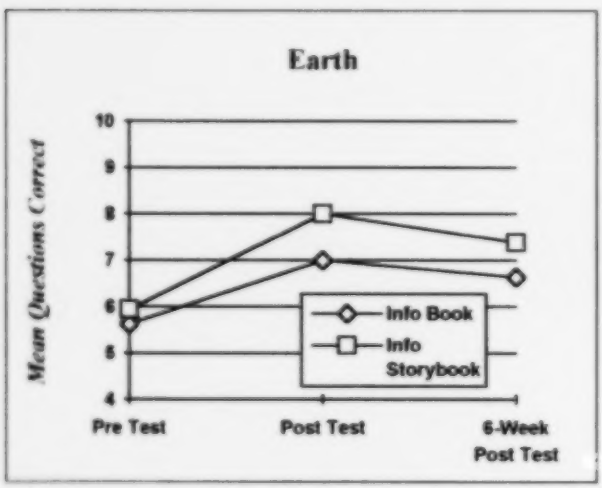
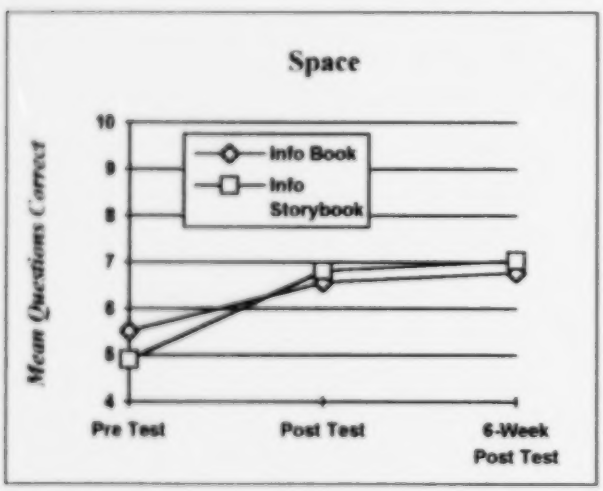
Figure 1: Number of Questions Correct by Text Type



	Pre Test	Post Test	6 Week Post Test
Info Book	$\bar{X}$=5.57 SD=1.63	$\bar{X}$=6.78 SD=1.64	$\bar{X}$=6.70 SD=1.46
Info Storybook	$\bar{X}$=5.42 SD=1.82	$\bar{X}$=7.41 SD=1.63	$\bar{X}$=7.21 SD=1.42

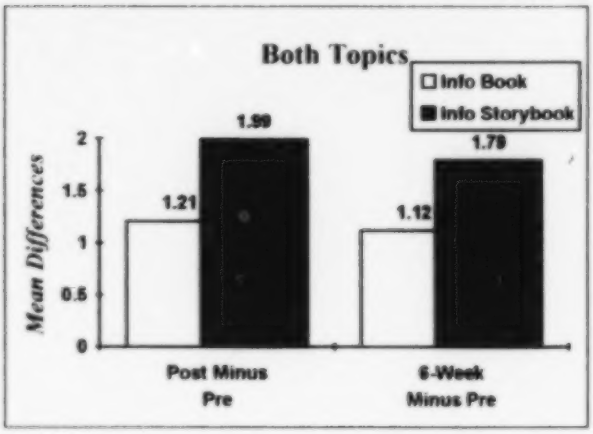


	Pre Test	Post Test	6 Week Post Test
Info Book	$\bar{X}$=5.62 SD=1.48	$\bar{X}$=7.00 SD=1.61	$\bar{X}$=6.62 SD=1.47
Info Storybook	$\bar{X}$=5.94 SD=1.72	$\bar{X}$=8.00 SD=1.43	$\bar{X}$=7.372 SD=1.27

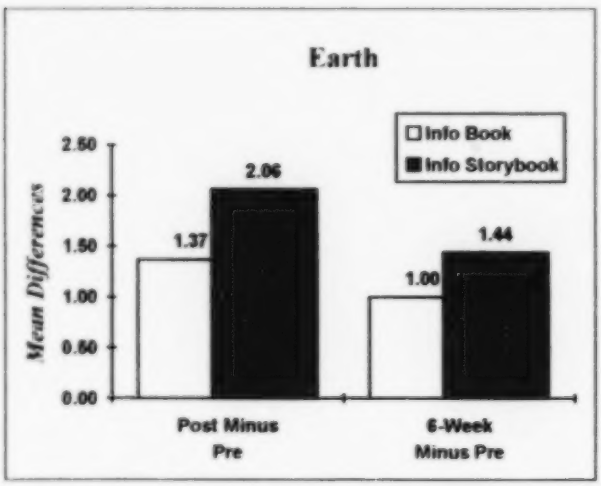


	Pre Test	Post Test	6 Week Post Test
Info Book	$\bar{X}$=5.52 SD=1.79	$\bar{X}$=6.56 SD=1.65	$\bar{X}$=6.77 SD=1.46
Info Storybook	$\bar{X}$=4.90 SD=1.78	$\bar{X}$=6.81 SD=1.62	$\bar{X}$=7.04 SD=1.56

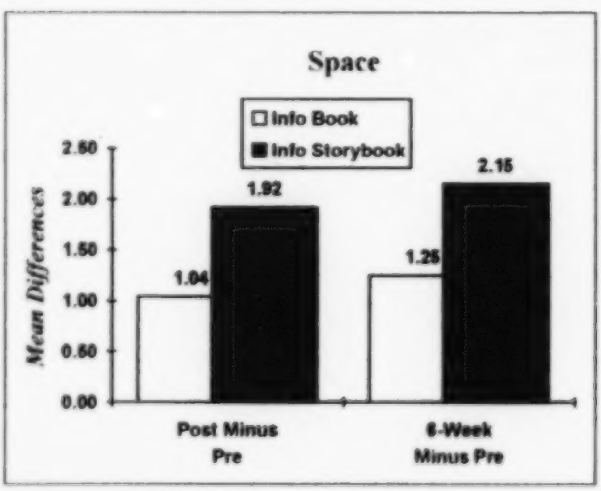
Figure 2: Increase in Number of Questions Correct by Text Type



	Post - Pre	6 Week - Pre
Info Book	$\bar{X}$ = 1.21 SD=1.65	$\bar{X}$ = 1.12 SD=1.97
Info Storybook	$\bar{X}$ = 1.99 SD= 1.74	$\bar{X}$ = 1.79 SD=1.68



	Post - Pre	6 Week - Pre
Info Book	$\bar{X}$ = 1.37 SD=1.83	$\bar{X}$ = 1.00 SD=2.02
Info Storybook	$\bar{X}$ = 2.06 SD= 1.66	$\bar{X}$ = 1.44 SD=1.81



	Post - Pre	6 Week - Pre
Info Book	$\bar{X}$ = 1.04 SD=1.46	$\bar{X}$ = 1.25 SD=1.94
Info Storybook	$\bar{X}$ = 1.92 SD= 1.84	$\bar{X}$ = 2.15 SD=1.47